



# Weather

*Grades K-3*

**Exhibit Guide**

Dear Educator,

Welcome to the Imagination Station's field trip resource! With the assistance of area K-12 educators, the Imagination Station has created learning guides to help structure a field trip that aligns directly to the concepts you are teaching in the classroom.

Students will explore weather with three Imagination Station exhibits:  
The Hurricane Chamber, the Tornado and the Cloud Machine.

**Your Weather Exhibit Guide contains:**

- Introduction- suggestions for using the guide with key concepts included
- State Standards Alignment for both Ohio and Michigan
- Chaperone Page(s)- tips for facilitating exhibit explorations with students
- Student Data Recording Pages that guide your students through exhibit-based explorations
- Post-Visit Activity to do back in the classroom

**How to Use This Guide:**

- Review the guide.
- Customize the guide for your needs. You can have your students complete the entire guide or just a particular component, depending on your field trip objectives.
- Print off sufficient copies of the Student Data Recording Pages for each student.
- Print off copies of the Chaperone Page for each of the chaperones. Divide your class into groups of 5-7 students and assign a chaperone to each group.
- Review the guide and your expectations with your students and prepare for a day of fun science learning at Imagination Station!
- Science Suggestion: Use this guide in combination with a science notebook so students can record observations and data throughout the day.

## Ohio's New Learning Standards

### **PREK ESS:**

#### **Weather changes every day.**

Wind, water and temperature are all part of daily weather changes. Weather changes throughout the day and from day to day.

**Water can be observed as lakes, ponds, rivers, streams, the ocean, rainfall, hail, sleet or snow.**

### **KINDERGARTEN ESS:**

#### **Topic: Daily and Seasonal Changes**

#### **Weather changes are long-term and short-term.**

Weather changes occur throughout the day and from day to day.

Air is a nonliving substance that surrounds Earth, and wind is air that is moving.

Wind, temperature and precipitation can be used to document short-term weather changes that are observable.

### **GRADE 2 ESS:**

#### **Topic: The Atmosphere**

#### **The atmosphere is made up of air.**

Air has properties that can be observed and measured. The transfer of energy in the atmosphere causes air movement, which is felt as wind. Wind speed and direction can be measured.

#### **Water is present in the air.**

Water is present in the air as clouds, steam, fog, rain, ice, snow, sleet or hail. When water in the air cools (change of energy), it forms small droplets of water in the air that can be seen as clouds. Water can change from liquid to vapor in the air and from vapor to liquid. The water droplets can form into raindrops. Water droplets can change to solid by freezing into snow, sleet or hail. Clouds are moved by flowing air.

#### **Long- and short-term weather changes occur due to changes in energy.**

Changes in energy affect all aspects of weather, including temperature, precipitation amount and wind.

### **GRADE 3 ESS:**

#### **Topic: Earth's Nonliving Resources have Specific Properties**

#### **Earth's nonliving resources have specific properties.**

Air and water are nonliving resources.

**Earth's resources can be used for energy.**

### **INQUIRY PRE K - 3**

- *Observe and ask questions about the natural environment.*
- *Plan and conduct simple investigations.*
- *Employ simple equipment and tools to gather data and extend the senses.*
- *Use appropriate mathematics with data to construct reasonable explanations.*
- *Communicate about observations, investigations and explanations.*
- *Review and ask questions about the observations and explanations of others.*

## Michigan Grade Level Content Expectations

### Science Processes:

- S.IP.E.1** Inquiry involves generating questions, conducting investigations and developing solutions to problems through reasoning and observation.
- S.IA.E.1** Inquiry includes an analysis and presentation of findings that lead to future questions, research and investigations.

### Earth Science:

- E.ES.E.1** Solar Energy: The sun warms the land, air and water and helps plants grow.
- E.ES.E.2** Weather: Weather changes from day to day and over the seasons.
- E.ES.E.3** Weather Measurement: Scientists use tools for observing, recording and predicting weather changes.
- E.SE.E.2** Surface Changes: The surface of Earth changes. Some changes are due to slow processes, such as erosion and weathering and some changes are due to rapid processes, such as landslides, volcanic eruptions and earthquakes.
- E.FE.E.1** Water: Water is a natural resource and is found under the ground, on the surface of the Earth and in the sky. It exists in three states (liquid, solid, gas) and can go back and forth from one form to another.
- E.FE.E.2** Water Movement: Water moves in predictable patterns.

## Stroboscope

Create your own stroboscope to observe the effects of gravity on water drops. You can construct your own stroboscope to 'freeze' moving water.

### Materials:

Heavy stock paper  
Pencil with an eraser  
Pushpin  
Flashlight (battery powered)  
Access to sink and cold water faucet

### Procedure:

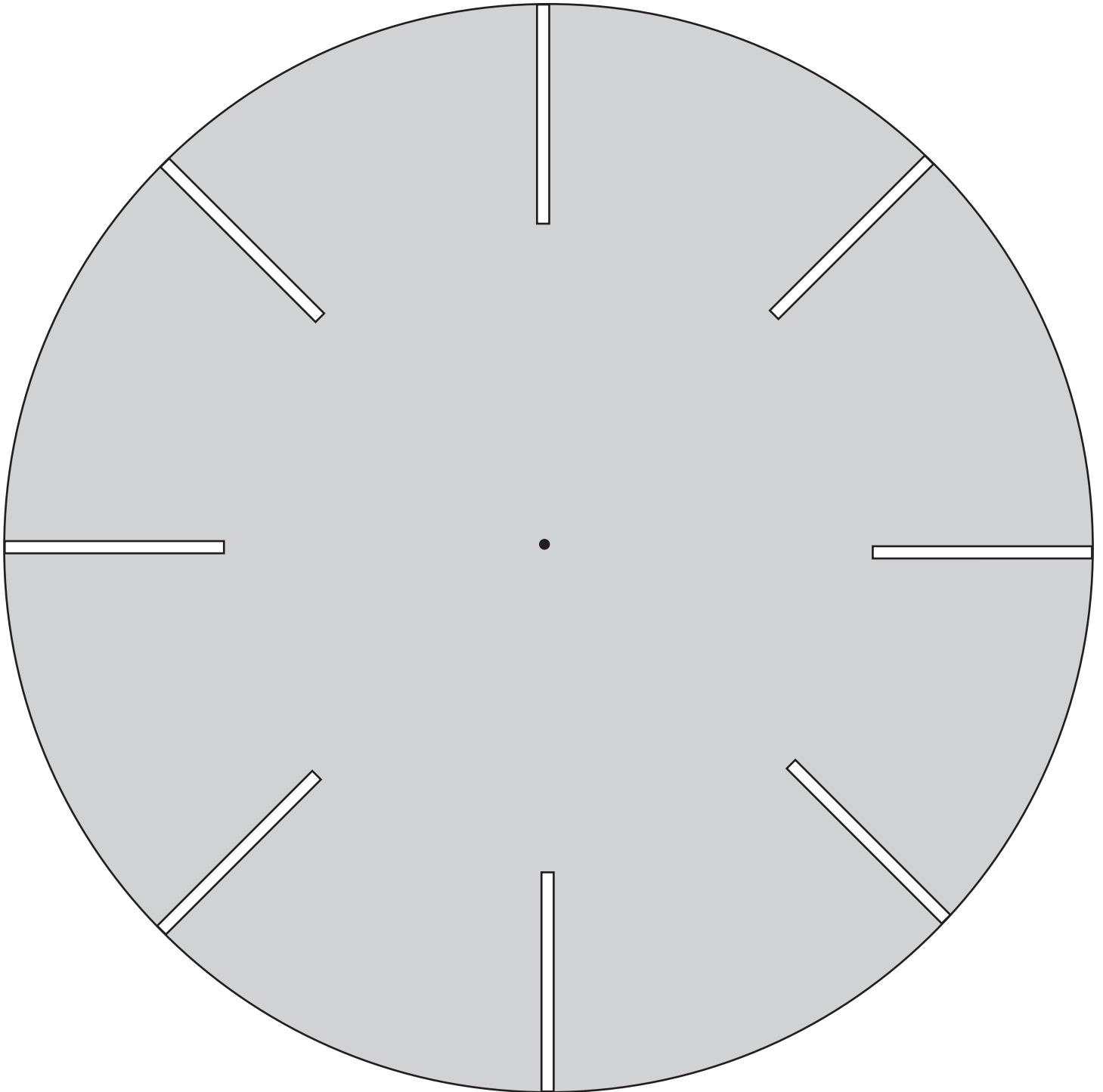
1. Using heavy paper, copy and cut out the disk using the template provided on the next page.
2. Insert a pushpin through the middle of the disk and push the pin into the center of the pencil eraser. Make sure your disk will spin easily.
3. Divide students into groups.
4. Giving each group a turn at the water faucet, start a slow steady stream of water droplets from the faucet. Aim the beam of the flashlight at the droplets. While one student adjusts the flashlight beam to get the correct angle, another practices spinning the slotted disk with a constant and continuous motion. Once a uniform speed is maintained, close one eye and peer through the rotating slotted rim.
5. It may take a few minutes to be able to get your stroboscope working for you. In order to 'freeze' the drops, you must spin the disk at a speed that is in sync with the falling droplets. Try changing the rate that your faucet is dripping or the rotational speed of the disk until you observe the 'frozen' droplets.

### What's the Science:

The actual shape of a water droplet (when gravity is not acting upon it) is round, not a teardrop, due to surface tension. When we watch water drip from the faucet, the water appears to form an elongated shape as gravity pulls it toward the sink basin. Surface tension causes the top to stick to the faucet as long as possible. The pull of gravity combined with the drop's surface tension with the faucet gives the drop its long shape.

A stroboscopic disc can create the illusion of frozen motion. It does this by offering a quick 'gated' look at the moving scene. If the gate is timed correctly, you can see the same part of the event (but with a new subject) again and again.

## Stroboscope



# Hurricane Chamber

In the Hurricane Chamber, I \_\_\_\_\_  
 (write activity tested here)

	Type of Wind	Wind Speed	I Noticed My . . . (draw or write)
Trial 1			
Trial 2			
Trial 3			

## Back in the Classroom:

1. Look at a picture taken during a hurricane. In the Hurricane Chamber, the wind blew down on you from above. Which direction does the wind blow in a real hurricane?

\_\_\_\_\_

2. Hurricanes gather their strength from the warm ocean water. Do you think there could be a hurricane at the North Pole? Explain.

\_\_\_\_\_

\_\_\_\_\_

3. How would you keep yourself and your house safe during a hurricane if you lived in a hurricane area?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

# Cloud Machine

Try the three activities below with the Cloud Machine. Write in the box about how your hands felt after each activity. Good descriptions include hot or cold, wet or dry.

	What I Did	How it Felt
Trial 1	When I put my hand in the cloud for 30 seconds, it felt...	
Trial 2	When I put my hand in the cloud for 60 seconds, it felt...	
Trial 3	After Trial 2, if I hold my hand in the air for 30 seconds, it felt...	

## Back in the Classroom:

1. Think about how your hand felt when you put it into the cloud. What do you think clouds are made of?

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2. Think about how your hand felt when it was inside the cloud. Where do you think rain comes from?

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3. Take a small sponge and slowly add water to it. Watch what happens when the sponge can no longer hold any more water. How is a sponge like a cloud? Explain using words or pictures.

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Dear Chaperone,

We're glad you're here! Thank you for volunteering to be a chaperone on your school's visit to the Imagination Station. This page explains field trip procedures and offers tips on how to facilitate an Imagination Station Exhibit Guide.

The Imagination Station requires students and chaperones to remain together at all times. Group size should be 7 students or less per one adult.

### Student Names:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.

### Schedule for the day:

Lunch Time:

Demonstration Time(s):

Departure Time:

### Imagination Station Exhibit Guides:

- Students should fill out their Data Recording pages while at the science center. The 'Back in the Classroom' section of the Data Recording pages can be completed when the students return to school.
- It should take about 1 hour to complete the activities.
- For older students, remind them to return their Data Recording pages to their teacher.
- For younger students, collect the Data Recording pages and hand them to the teacher at the end of the day.
- Have fun! A field trip is a great chance to interact with young people and see the wonder of science through their eyes.
- Ask open-ended questions. You don't have to be the science expert! Tell students to look up information when they return to the classroom or ask an Imagination Station Team Member about a specific exhibit.
- If a student is struggling with a portion of the Data Recording Sheet, ask questions like 'What have you done so far?' or 'What were you thinking about doing next?' These types of questions can help a student work through challenges and find their own solutions. Remember, your job is not to provide the answers!

# Visitor Guide

## Attractions

**High Wire Cycle** – This thrill ride hovers over 18 feet above the ground, suspended on a 1-inch cable with a 275 pound counterweight that enables any person to defy gravity.  
• You must be 54" to ride

**BOYO** – Using science similar to that of the classic yo-yo, a rider is propelled up to 13 feet in the air using his or her own strength and some basic science principles.  
• You must be 54" to ride

### Simulator Theater – Over The Edge!

Experience every turn, jolt, twist and drop. With HD visuals, surround sound and a responsive platform, you have an adventure without leaving your seat!

- Imagination Station members ride FREE! You must have a token to ride. Tokens are \$2 and available at Simulator entrance or Visitor Service.
- You must be 42" to ride.
- Elevator available. Please contact a team member.

## Demonstrations

### Extreme Science Theater

Interactive demonstrations with an exciting EXTREME twist! Check monitors located at Visitor Service or at elevators for times.

## Learning Worlds

**Eat It Up!** – This Learning World is focused on nutrition and exercise and tells the story of how the choices you make affect your body. Eat Smart. Play Hard. Have Fun.

**Energy Factory** – Get a glimpse into the abstract world of oil refining and solar energy.

**Flex Space** – This ever-changing space features some of the best exhibitions from North America and great experiences that we've created right here at Imagination Station.

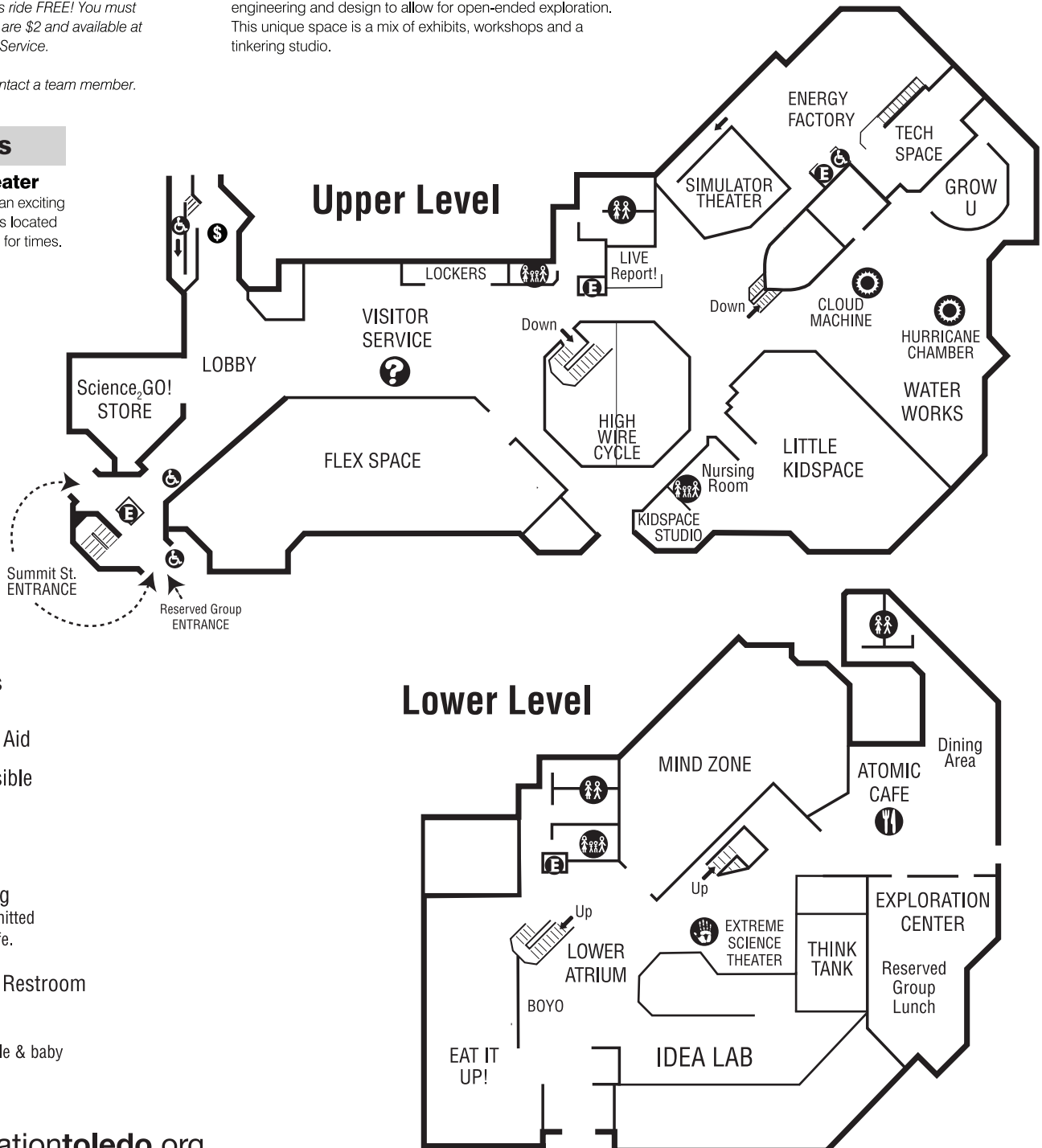
**Grow U** – Let Mother Nature be your guide as you take on FARM 101: Know It to Grow It.

**IDEA Lab** – This Learning World combines science, art, engineering and design to allow for open-ended exploration. This unique space is a mix of exhibits, workshops and a tinkering studio.

**Little KIDSPACE™** – Our littlest adventurers (kindergarten and under) can hop aboard our fire truck, shop in the grocery store or climb on our favorite tree house while learning science fundamentals.

**Mind Zone** – Home to the Distorted Gravity Room, discover how the mind processes, interprets and creates illusions and perceptions.

**Water Works** – Discover the slippery science of water and explore nature's most powerful resource.



- ⚙️ WEATHER Exhibits
- ❓ Information  
Lost Persons/First Aid
- ♿️ Wheelchair Accessible
- E Elevator
- 👤 Demonstration
- 🍴 Restaurant/Vending  
Food & beverages permitted  
only in Atomic/H2O Cafe.
- 🚻 Men's & Women's Restroom
- 👨‍👩‍👧‍👦 Family Restroom  
Special needs accessible & baby  
changing facilities.

## Hurricane Chamber

### Student Data Recording Page Questions:

This room offers visitors the opportunity to feel the strength of hurricane force winds without all the dangerous effects.

1. First, have your group observe a person inside the Hurricane Chamber.
2. Students should pick an action to test in the Hurricane Chamber. Good actions would have students jumping in the air, lifting their arms to their sides, etc. Have each student enter the room at the lowest wind speed. Record their results on their Data Recording Sheet.
3. Set the Hurricane Chamber to the second wind speed. Have students test the same activities at this wind speed. Make sure the students record their results!
4. Have your students enter the Hurricane Chamber at the highest speed. Again, have them test the same activities at this wind speed. Complete the chart.

**FOR YOUNGER STUDENTS:** Encourage young students to draw pictures or write key words in the space available. If students are having difficulty completing the Data Recording Sheet, you can fill out the sheet for the group, just make sure the students are providing you with the answers!

### IN THE KNOW

A hurricane, or tropical cyclone, is a large storm that forms near the equator. In the Northern Hemisphere, these large storms turn counter-clockwise and the center of the storm is called the 'eye' because it is typically calm.

Special conditions are needed to create a hurricane. First, very humid and warm air needs to be trapped between the earth and a layer of cooler air. Only near the equator is the air warm enough to create this condition. Additionally, fairly strong winds must be blowing in the same direction. If the winds are blowing at different speeds or in different directions, it will tear apart the hurricane. The warm air near the earth wants to rise, as warm air tends to do. As this warm air rises, it gains energy and heats up as the water vapor condenses. This causes the air to rise faster and faster. Cooler air pushes in on the warm, rising air causing this circular motion to become increasingly powerful.

The eye of the storm has little to no precipitation because it is a high-pressure zone. The winds spiral inward and rise up on the outside of the hurricane making the eye of the hurricane an area of high-pressure downdrafts.

Hurricanes are categorized by wind speed. Winds can vary between 64 mph-140 mph. When a hurricane reaches landfall, it typically loses power. This is because it can no longer draw that warm, moist air from the ocean that gives the hurricane its energy.

## Cloud Machine

### Student Data Recording Page Questions:

The Cloud Exhibit offers visitors the chance to feel a cloud and think about what composes clouds.

1. Try the three activities below with the Cloud Machine. Write in the box about how your hands felt after each activity. Good descriptions include hot or cold, wet or dry.
2. When I put my hand in the cloud for 30 seconds, it felt...
3. When I put my hand in the cloud for 60 seconds, it felt...
4. After Trial 2, if I hold my hand in the air for 30 seconds, it felt...

### IN THE KNOW

A cloud is composed of water and particulate matter. Particulate matter is tiny particles (dust, pollen, dander, salt, etc.) suspended in the air. A great way to explain particulate matter to young children is to have them think about the sun shining through a big window. They have likely seen the small little particles that are visible in the air when this occurs.

When the students place their hands in the cloud machine, their hands will get moist. This is because the cloud is composed of tiny droplets of water suspended in the air. When students take their hand out of the cloud exhibit, their hands will feel cool. The droplets of water that had formed on their hands will evaporate. This is because the warmth of their hands heated the water and caused it to evaporate. This results in a transfer of heat from the hand to the water and, as a result, the hand feels cool.

Clouds are formed when warm, humid air rises into the cooler atmosphere. This air condenses and forms tiny droplets that are suspended in clouds. These droplets tend to suspend themselves around the particulate matter such as dust, pollen, etc. There are many different types of clouds and the type formed depends on the environmental conditions when the cloud was created.

### Activity

Help students to fill out their charts. Encourage them to use good descriptive words to explain what they felt- wet, dry, warm and cold are all good descriptors.

For younger students, you may want to be the recorder and write down their descriptions as they are dictated to you.